REMARKS

Claims 1-11 and 13-34 are currently pending in the application. By this amendment, claim 12 is canceled. Reconsideration of the rejected claims in view of the amendment and the following remarks is respectfully requested.

Amendment is Proper for Entry

Applicants submit that this amendment places the application in condition for allowance by canceling claim 12 per the Examiner's suggestion in the outstanding Office Action. Thus, the amendment does not raise any new issues that would require further search and/or consideration. Therefore, entry of this amendment is proper. Alternatively, Applicants submit that this amendment places the application in condition for appeal.

Allowed Claims

Applicants appreciate the indication that claims 13-22 are allowed. Applicants also appreciate the Examiner's indication that claims 3-8, 11, 25 and 27 contain allowable subject matter and would be allowable if presented in independent form. However, at this time, claims 3, 11, 25 and 27 are not being presented in independent form because it is believed that claims 1 and 23, from which these claims depend, are allowable over the applied art of record. Furthermore, Applicants submit that all of the pending claims are in condition for allowance and that the rejection under § 102 should be withdrawn.

Claim Objections

Claim 31 was objected to for being a substantial duplicate of claim 12. By this amendment, claim 12 is canceled and the objection is rendered moot. Accordingly, Applicants request that the objection be withdrawn.

35 U.S.C. §102 Rejection

Claims 1, 2, 9, 10, 12, 23, 24, 26 and 28-34 were rejected under 35 U.S.C. § 102(b) as being anticipated by an Article entitled "A General Probabilistic Framework for Worst Case Timing Analysis" by Michael Orshansky et al. ("Orshansky"). This rejection is respectfully traversed.

To anticipate a claim, each and every element as set forth in the claim must be found, either expressly or inherently described, in a single prior art reference. MPEP §2131. The Examiner asserts that Orshansky discloses all of the features of the claimed invention. Applicants submit, however, that the Orshansky does not contain each and every feature of the claimed invention.

Independent claims 1 and 31

The invention relates to methods for evaluating timing in integrated circuits and more particularly to methods and systems for evaluating timing of signals. By way of non-limiting example, embodiments of the invention provide methods for evaluating the delay in racing paths of an integrated circuit by using static timing analysis (STA) techniques (e.g., cell-based delay) and by evaluating the delays due to effects caused by multiple metallization layers in the integrated circuit (e.g., wire-dependent delay). The results may, for example, provide a circuit designer with a more realistic estimate of the off-tracking or slack to be expected, as well as a better understanding of how process variations affect off-tracking or slack. By way of further non-limiting example, methods according to the invention may be used to diagnose timing problems in existing circuits and to locate timing errors, or to design new integrated circuits. The invention may be used, for example, to solve a very practical problem of comparison of racing paths, with an automatic way to look at the contents of the paths in a post-processing step after timing is finished. The invention may also be used, for example, to establish simple rules that allow a comparison of paths and a determination of whether there is an

exposure to process variations, to correlated variations between paths and uncorrelated variations along a path. More particularly, independent claims 1 and 31 recite, in pertinent part,

> ... grouping ones of the one or more elements in the early path with ones of the one or more elements in the late path having similar delay characteristics; and
>
> deriving an adjusted timing slack for the at least one set of racing paths by at least partially canceling delay contributions from grouped elements having similar delay characteristics.

Orshansky does not disclose these features, and therefore does not anticipate independent claims 1 and 31.

The Examiner is of the opinion that Orshansky discloses these features of claims 1 and 31 on page 557, section 4.1, and page 558, col. 1, lines 17-23. Applicants respectfully disagree.

Instead, Orshansky shows methods and theorems for determining statistical estimates of timing of circuits. The Orshansky approach is entirely probabilistic, seeking to construct the probability distribution of an achievable clock period for a given circuit (page 556, col. 2). Orshansky discloses that the delay of any gate can be expressed as an arbitrary function. In order to establish an expression for the pair-wise covariance of gate delays, Orshansky assumes that the arbitrary function can be expressed as a first order Taylor expansion (page 558, col. 1).

Contrary to the Examiner's assertion, expressing an arbitrary function as a Taylor expansion does not constitute deriving an adjusted timing slack for the at least one set of racing paths by at least partially canceling delay contributions from grouped elements having similar delay characteristics, as recited in claims 1 and 31. Expressing an arbitrary function as a Taylor expansion has absolutely nothing to do with deriving an adjusted timing slack, much less, doing so by at least partially canceling delay contributions from grouped elements having similar delay characteristics. A Taylor expansion (also commonly referred to as a Taylor series) is a mathematical expression and, more specifically, is a power series expansion of a function about a point. This

power series expansion of the function is an approximation of the function that allows for easier computation when using the function. This is not a cancellation function as recited in the claimed invention.

As such, Orshansky's approximation of the arbitrary gate delay function as a power series (i.e., Taylor expansion) does not constitute deriving an adjusted timing slack. Rather, it is merely a mathematical re-characterization (i.e., approximation) of an already arbitrary function. In fact, Orshansky makes no mention of slack timing, much less of deriving an adjusted slack timing. Furthermore, Orshansky is completely silent as to canceling delay contributions from grouped elements having similar delay characteristics. These recited claim features simply are not shown by Orshansky. Therefore, Orshansky does not contain each and every feature of claims 1 and 31 and does not anticipate the claims.

Independent claim 23

Independent claim 23 recites, in pertinent part,

> ... computing by using the location information a variation in a difference in delays of the elements of the at least one pair; and
>
> deriving from the variation a slack for the late path to the timing test and the early path to the timing test.

The Examiner is of the opinion that Orshansky discloses these features in the first paragraph of section 6 on page 560. Applicants respectfully disagree.

Orshansky discloses a "variance of path delays". Variance is a statistical expression and, more specifically, is a measure of the dispersion of the values of a random variable about the expected value of the random variable. In Orshansky, each path has an expected value of delay (*i.e.*, $E\{D_i\}$) and a corresponding variance of path delay (*i.e.*, σ_i). Orshansky teaches that the variance of the path delay σ_1 of path 1 may be different from the variance of the path delay σ_4 of path 4. Because of this difference in variance of path delay, path 4 may be stochastically slower than path 1 even though

the expected delay $E\{D_4\}$ of path 4 is less than the expected delay $E\{D_1\}$ of path 1. This, however, is merely a statement of the statistical properties of the paths, and does not constitute computing by using location information a variation in a difference in delays of the elements of the at least one pair, as recited in claim 23. There is no mention of computing a variation, much less of computing a variation by using location information. Furthermore, there is no teaching of deriving a slack from the computed variation. To the contrary, Orshansky does not even use the term "slack". Thus, it is clear that the recited features are not shown in Orshansky.

Dependent Claims

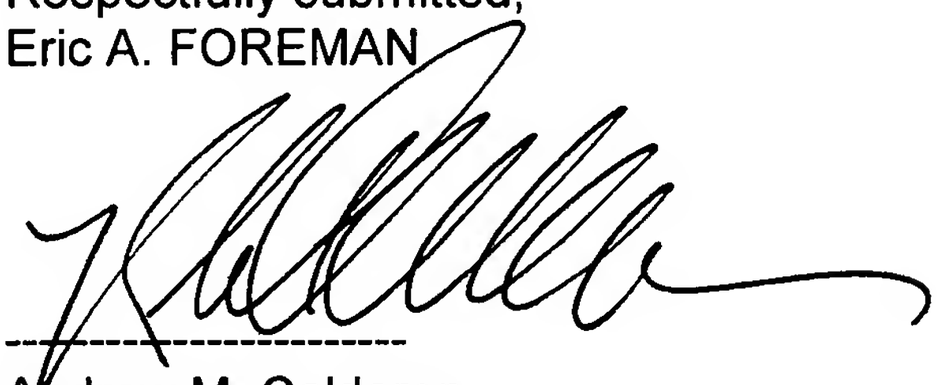
As to the dependent claims, Applicants submit that claims 2, 9, 10, 24, 26, 28-30 and 32-34 depend from an allowable independent claim and are allowable based upon the allowability of the independent claim.

Accordingly, Applicants respectfully request that the rejection over claims 1, 2, 9, 10, 23, 24, 26 and 28-34 be withdrawn.

CONCLUSION

In view of the foregoing amendments and remarks, Applicants submit that all of the claims are patentably distinct from the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue. The Examiner is invited to contact the undersigned at the telephone number listed below, if needed. Applicants hereby make a written conditional petition for extension of time, if required. Please charge any deficiencies in fees and credit any overpayment of fees to Attorney's Deposit Account No. 09-0456.

Respectfully submitted,
Eric A. FOREMAN



Andrew M. Calderon
Reg. No. 38,093

Robert W. Mueller
Reg. No. 35,043

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GREENBLUM & BERNSTEIN, P.L.C.
1950 Roland Clarke Place
Reston, VA 20191
(703) 716-1191